UNIVERSITY OF B.C. LIBRARY
3 9424 05124 776 2

STORAGE ITEM
PROCESSING-ONE

Lp1-E19C
U.B.C. LIBRARY

THE LIBRARY

THE UNIVERSITY OF
BRITISH COLUMBIA

Digitized by the Internet Archive
in 2010 with funding from
University of British Columbia Library

http://www.archive.org/details/treepamphlet1n13cana

SD 437 A4
No. 1
THE LIBRARY
University of British Columbia

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

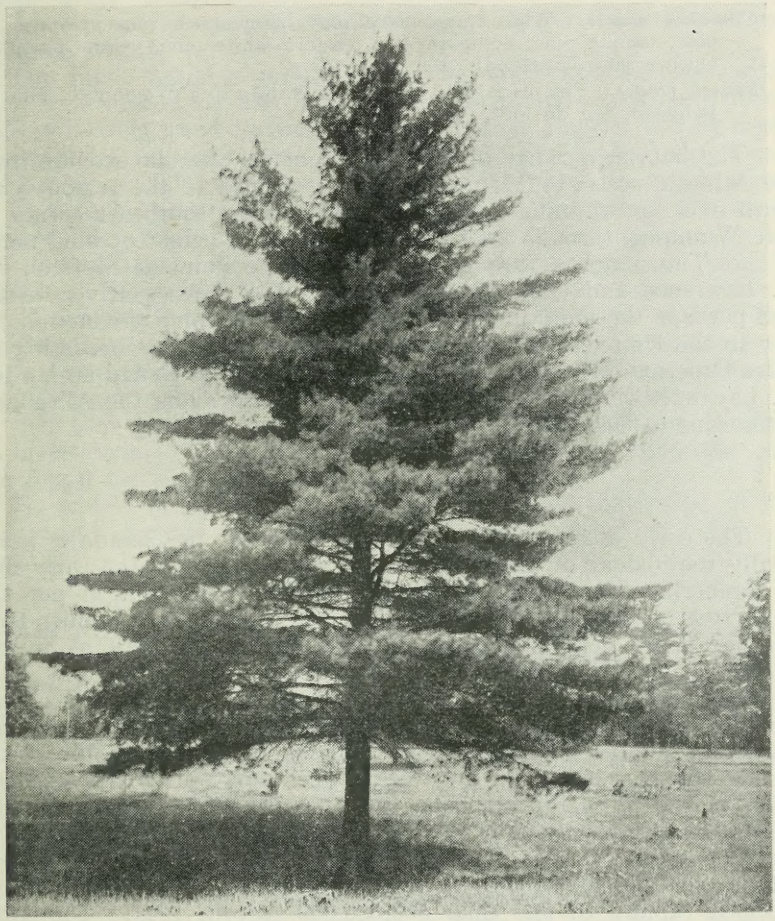
851

WHITE PINE

Tree Pamphlet No. 1

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1923

WHITE PINE



A Typical White Pine Tree

Grown in the open, with light reaching it without hindrance from all sides, the tree assumes this conical form. Grown in the forest, with neighbouring trees cutting off its supply of light from the side, the branches gradually die, through being deprived of light, and fall off. The tree thus becomes a tall column, with the foliage and branches confined to the upper part. It is this latter form of tree that produces the clear, easily worked lumber, free of knots, that has made the White Pine the favourite in such a large proportion of the wood-using industries.

WHITE PINE. Pinus Strobus, Linn.

Common names: White pine, cork pine, Weymouth pine, pattern pine, sapling pine, pumpkin pine, eastern white pine, yellow pine, Quebec pine (England).

French names: Pin blanc, pin jaune, pin potiron, pin Weymouth, pin baliveau, pin du lord.

The botanical range of the white pine in Canada extends from the Atlantic ocean to Manitoba. It is confined to the region lying south of a line running approximately from the southeast corner of lake Winnipeg, through lake Nipigon, along the height of land north of lake Timiskaming, through lake St. John to Point de Mots on the St. Lawrence and Cape Breton Island. The Ottawa River valley was perhaps the most important centre of white pine production.

In the United States the tree is found in the states bordering on lakes Superior, Michigan and Huron, and from the Canadian border, St. Lawrence river and lake Ontario southward along the Alleghany mountains to Georgia.

PLACE IN THE LUMBER INDUSTRY

The early history of the lumbering industry in Canada is practically the history of the lumbering of white pine. In the early day of lumbering, the white pine was considered the main, if not the only, tree of value in the forests. It was the premier lumber tree, and for years held first place as lumber-producer both as to the quantity cut and the value of the product.

As a result of wasteful cutting and forest fires, the white pine has, for some years, been falling behind the spruces as the most important lumber-producer. The Douglas fir of the Pacific coast, during the past three or four years, has removed it from second place in regard to the quantity cut. Ten or twelve years ago the white pine formed about 22 per cent of the total lumber produced in the Dominion. To-day it forms about 15 per cent. From a total cut of over 2,500,000,000 feet, board measure, in 1911, this pine has dropped rapidly to less than 500,000,000 feet in 1921. Comparatively little of the original white pine stands to-day. Of the 450,000,000,000 feet which probably occupied its natural range in Canada when settlement first began, it is doubtful if more than 25,000,000,000 feet remain to-day. Practically the only virgin stands that are left are those in or adjacent to the Timagami, Mississaga and Quetico forest reserves in Ontario, and those located at the headwaters of the tributaries of the Ottawa river in the province of Quebec.

THE WOOD AND ITS USES

The wood of the white pine is light, soft, fairly strong in relation to its weight, compact, and fairly durable. It has a fine, even, straight grain, is not splintery, can be easily and rapidly seasoned, and, once properly seasoned, holds its shape better than most other coniferous woods.

The most valuable properties of the wood are the ease with which it is worked and the fact that it shrinks and checks but little. It is the leading wood for building construction, since it can be used to advantage in every part of a building. For sashes and doors there are few woods equal to it. The ease with which the woodworker can fit it to his requirements makes the white pine one of the most useful woods. One of its most exacting uses is in the making of patterns for castings. Specially clear, soft grades are selected for this purpose, to which the patternmakers have given the name "cork" pine, "pumpkin" pine, and "pattern" pine. These names in some localities have become attached to the tree itself. The usefulness for patternmaking is due to the ease with which the wood cuts in any direction, either along or across the grain, and, above all, to the fact that it holds its shape without warping, checking, shrinking, or swelling to any extent. No really satisfactory substitute has been found for white pine for this purpose.

So widely is the wood of the white pine used that a list of its uses would include practically every woodworking industry in Canada.

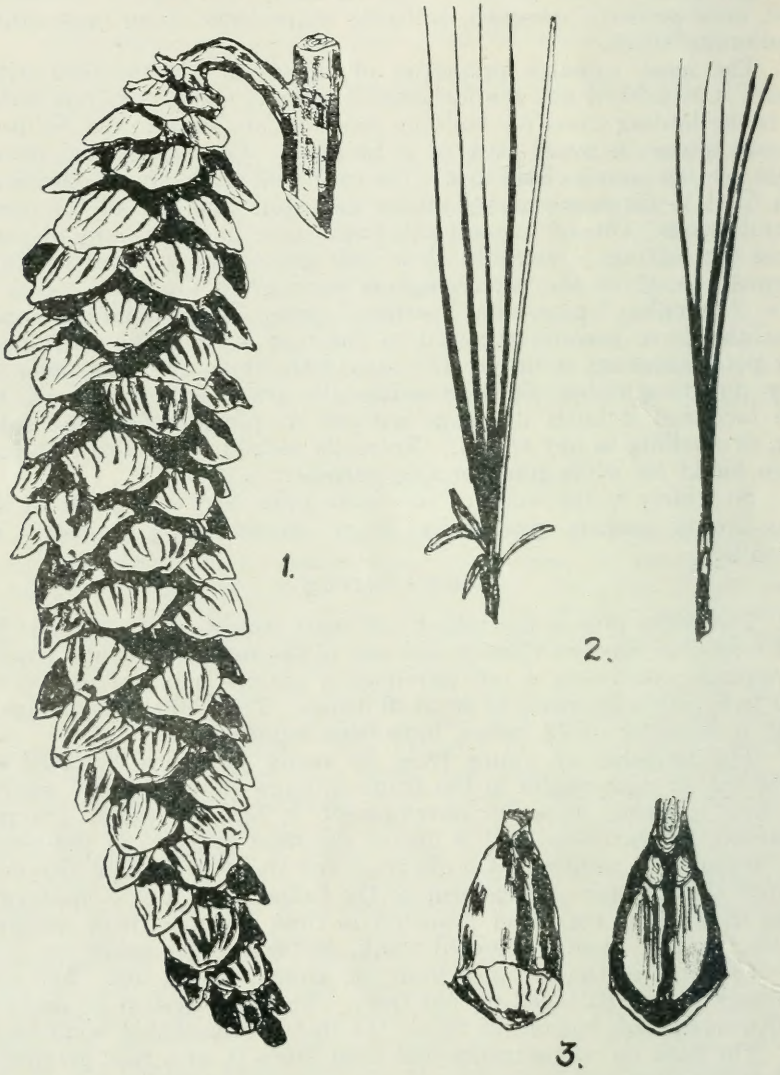
HABIT AND FORM

The white pine is the tallest and most stately of the conifers in the forests of Eastern Canada and one of the most beautiful. Under favourable conditions it not infrequently attains a height of 100 to 150 feet, with a diameter of 30 to 40 inches. Trees 250 feet in height, with a diameter of 72 inches, have been reported.

The branches on young trees for many years are disposed to grow out at right angles to the trunk in more or less regular whorls of five. During its early development it has, therefore, a symmetrical, conical form, and is one of the most graceful of the pines for ornamental planting. On old trees and those growing in crowded stands this regular arrangement of the branches is not so apparent. Due to shading, the lower branches in time die, and there remains a tall, straight, slightly tapered trunk, destitute of branches for half to two-thirds of the distance from the ground to the top. The top becomes rather flattened on old trees. The root system is shallow and wide-spread, but on the whole the tree is remarkably wind-firm.

The bark on young trunks and most limbs is, as a rule, greenish-brown in colour and quite smooth. On larger trees the bark becomes dark gray and divided by shallow fissures into broad, continuous ridges.

The leaves, like those of all pines, are needle-like (see Fig. 2). They are from 3 to 5 inches long, soft and delicate, and of a clear light-green colour. If one examines the needles of the white pine,



it will be found that they occur in bundles of five and are surrounded at the base with a thin, paper-like wrapper. By means of these five needles in a bundle the white pine can be identified without any

effort. No other tree native to Eastern Canada has this arrangement. One of the easiest methods of recalling the number of needles in a bundle is to remember the first word of its name, i.e., white, has five letters.

There are, of course, other five-needle pines native to Canada, but, since their natural range does not coincide with that of this pine, there is not likely to be much confusion. The other native five-needle pines include the Western White Pine (*Pinus monticola*), Limber Pine (*Pinus flexilis*) and White-barked Pine (*Pinus albicaulis*). All these are confined to the mountainous regions of Western Canada.

The cones (see Fig. 1) of the white pine are from 5 to 10 inches long, slender, slightly curved, and stalked. They are the longest cones produced by any of the conifers of Eastern Canada, and, with the exception of those of the Western White Pine, the longest cones of any native tree. The scales of the cone (see Fig. 3) are thin, but slightly thickened at the apex. There is no bristle at the tip of the scale, a feature which is characteristic of certain other native pines. The cones, like those of all pines, require two years to develop. During the first season they reach a length of from one to two inches, and are of a purplish colour. The following spring they turn green, and by July have attained their full size. By the latter part of August, or early in September, they turn brown, and open, shedding their seed. The cones drop from the trees after the seed is shed.

The seed is reddish brown and winged, borne two beneath each cone-scale (see Fig. 3). Because of their wings the seed is readily carried by the wind to a considerable distance from the tree.

White pine prefers fertile, well-drained soil, but grows satisfactorily on any light soil provided it is not the driest sand. It is not well suited for growing in very wet or swampy places. In the forests it is commonly found associated with the spruce, hemlock, red pine, and the Northern hardwoods, such as the birches and poplars. It also occupies large areas to the exclusion of most other species.

NATURAL REPRODUCTION

The white pine reproduces readily and grows rapidly under favourable conditions. When growing it requires, however, more light than many of its associates, such as the spruce and hardwoods, and therefore where it must compete with these to restock a cut-over area, it is at a decided disadvantage.

Although it reproduces itself well after one light burn that opens up the stand sufficiently to the light and permits the seed to reach mineral soil, heavy or repeated fires result in its practical extermination. For this reason, many regions which were once well stocked with white pine now contain practically none. There are

some areas in which the natural reproduction has been fairly satisfactory, such as those lying in that section of Ontario situated between Georgian bay and the Ottawa river. Here the lumbermen to-day are cutting in second-growth pine.

PROPAGATION AND PLANTING

The white pine is one of the most important trees for reforesting waste lands, and thousands of young trees have been set out in the provinces of Ontario and Quebec by private owners with planting stock provided by the provincial governments.

Young plants are grown from seed sown in nursery beds. When the seedlings are one to two years old they are transplanted into larger beds and allowed to grow for one or two years before being taken up and set out in the permanent site. They are then from 12 to 18 inches high. In planting, from 1,200 to 1,700 trees are set out per acre, depending upon whether the trees are spaced 5 feet or 6 feet apart. Once the young trees are established, the rate of growth is rapid and evenly maintained. In 35 years the trees in a fully stocked plantation will reach from 40 to 50 feet in height. On very poor soil a plantation 31 years after setting out has been estimated to yield 15,000 feet, board measure, per acre. In another instance, a 50-year-old plantation yielded 41,000 feet board measure per acre.

The history of the white pine probably shows more clearly than that of any other tree the necessity of every man, woman and child whom duty or pleasure takes into the woods co-operating with the provincial and Dominion forest services in the protection of our forests against fires.

There is no reason why all the famous pineries of this country should not become increasingly productive, provided they are protected from fire and sufficient of the competing species are removed to give the young pines a chance to grow.

LIBRARY
BUILDING

Additional copies of this document and a list of other publications issued by the Forestry Branch may be had upon application to the Director of Forestry, Ottawa.

CLASSN. SD437. A 4
SERIES ..... No. 2
THE LIBRARY
The University of British Columbia

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

WHITE SPRUCE

Tree Pamphlet No. 2

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1923

WHITE SPRUCE

The above picture represents a young White Spruce tree grown in the open, with ample light and space on every side. When grown in the forest, such a tree gradually assumes a very different form. The lower part of the tree becomes quite cleared of branches, thus forming a tall column, and the foliage is borne only on the upper portion. It is the lower part, grown in this way, that gives the clear lumber. The characteristic habit of the tree, its foliage, etc., are more clearly shown in such a specimen as the above than they could be shown in a view of a tree of the forest type.

WHITE SPRUCE. Picea canadensis (Mill.) B.S.P.

Common names: White spruce, skunk spruce, single spruce, northern spruce (Labrador), cat spruce (Nova Scotia), pine (Hudson Bay).

French names: Epinette blanche, épinette grise, épinette à biere, sapinette blanche (France), sapin blanc.

The white spruce is one of the most widely distributed of Canadian trees. It extends from the Atlantic coast to Alaska and as far north as the mouth of the Mackenzie river within twenty miles of the Arctic ocean. There are four other species of spruce native to Canada. Red spruce (*Picea rubra*) is confined to the Maritime Provinces and the eastern part of Quebec. Black spruce (*Picea mariana*) occupies practically the same range as the white spruce. Sitka spruce (*Picea sitchensis*) is confined to the Pacific coastal region. Engelmann spruce (*Picea Engelmanni*) is found in the inland mountainous region of British Columbia and the east slopes of the Rocky mountains in Alberta.

ANNUAL CONSUMPTION AND PRESENT STAND

In the lumber market the different species are not as a rule separated. All are commonly sold simply as spruce, and therefore figures for the quantity of each species cut are not available. Grouping all species together, however, it may be said that spruce is Canada's most important tree to-day. Both as a lumber and a pulpwood producer it has for some years occupied first place. More than 1,250,000,000 feet board measure of spruce lumber is sawn each year. This forms approximately one-third of the total lumber produced each year in Canada. In addition, over 1 500,000 cords of spruce are cut for pulpwood purposes, forming from 70 to 80 per cent of the total cut of pulpwood each year. We can therefore estimate that roughly some 2,250,000,000 board feet of spruce are cut in our forests each year for the lumber and paper mills. This figure does not take into consideration the quantity consumed for railway ties, poles, firewood and other purposes, for which very large quantities are used.

Although accurate information is not available as to the quantity of spruce still standing, there is estimated to be about 325,000,000,000 feet board measure of which probably 150,000,000,000 feet is saw-timber and the balance of pulpwood size. The white spruce probably forms about 45 per cent of the total spruce stand or about 145,000,000,000 feet.

The use of spruce for lumber has increased greatly in recent years with the increased scarcity of white pine. For the better grade of rough dimension lumber it has practically taken the place of white pine in the lumber market of this country.

White spruce probably forms the greater part of the spruce lumber on the market. It is used in greatest quantities by the manufacturers of building material. Large quantities are used for siding, flooring, and roof sheeting, as well as for the manufacture of sash, doors, and house trimming. Box factories use the wood to a large extent, since its toughness, strength, lightness, and nail-holding qualities fit it for this purpose. Its lack of taste and odour fit it for food-containers.

THE WOOD: QUALITIES AND USES

The wood of the white spruce is light in colour and weight. It is soft, stiff, tough and very strong taking weight into consideration. It has a fine even grain, is easy to work and does not split easily. The lumber seasons well, holds nails well, is tasteless, odourless and comparatively free from resin.

One of the distinctive characteristics of spruce wood, and one which it does not share with any other wood to an equal extent, is its resonance. Its quality of prolonging and increasing sound vibrations is remarkable, and therefore manufacturers of piano sounding-boards use it almost exclusively. For the same reason it is used for organ pipes and many small musical instruments, such as guitars, mandolins, etc.

The wood of white spruce has also been used to some extent for certain parts of the framework of aeroplanes. The wood of the Sitka spruce has, however, to a large extent replaced it because of the large proportion of clear, flawless material produced by that tree.

The use of spruce for pulp-making in Canada in the past few years increased enormously with the rapid growth of that industry. The wood has the long, tough, almost colourless fibre which is necessary for good pulp, and in addition is, for a coniferous tree, remarkably free from resin. These qualities ensure it a place in pulp manufacture in spite of the increasing use of other woods. At the present time the white spruce forms the greater part of the spruce used for pulping purposes.

HABIT AND CHARACTERISTICS

The white spruce is the largest and most handsome of the Eastern spruces. Under favourable conditions it may reach a height of 100 feet or more, with a diameter of from 3 to 4 feet. Ordinarily, however, it is rarely found above 60 to 70 feet in height and from 1 to 2 feet in diameter.

Where it has a chance to develop it produces a beautiful narrow, symmetrical, conical-shaped crown which, at a distance, has a very spire-like appearance.

The bark is thin and smooth, becoming flaky, with small ashy-brown scales. Its thin bark makes it susceptible to injury by fire.

The leaves are from one-third to three-quarters of an inch long and more or less four-sided in cross-section. (See Fig. 1.) They are sharp-pointed, and pale blue-green in colour. When crushed they have a very characteristic pungent odour. It is this peculiarity which gives the tree the names "skunk" and "cat" spruce and is a feature which is useful in distinguishing between it and the other eastern species.

1.

2.

The cones of the white spruce are from 1½ to 2 inches long. (See Fig. 2.) The cone scales are narrow in proportion to their length and very flexible and elastic. An open dry cone when crushed in the hand will spring back more or less into shape. This characteristic distinguishes it from the cone of the black spruce, which is more brittle and will usually break with the same treatment. In shape the white spruce cone is long and narrow, as compared with the more spherical black spruce cone. The margins of its scales, too, are smooth and not ragged, as is usual with the black spruce. The white spruce cones drop off each year after the seed is shed, while those of the black spruce sometimes remain attached to the trees for years.

It is somewhat difficult for the inexperienced person to distinguish between the white and the red spruce. Even the expert is sometimes puzzled. The red spruce lacks the narrow conical aspect of the white spruce, for it usually has a rather wide-spreading open crown, composed of a comparatively few large irregular branches which droop more or less and are upturned at the tips. The bush-

man usually distinguishes them by the bark, which, in the case of the red spruce, has a reddish-brown cast as compared with the grey of the white spruce.

PLANTING FOR USE AND ORNAMENT

The white spruce has been one of our most popular evergreens for decorative planting and it well deserves its popularity. With its compact crown and shimmering green foliage it is one of the most handsome trees. It makes rapid growth and is extremely hardy. It can be grown in any province from the Atlantic to the Pacific, and is not very particular as to the soil requirements. It will grow on damp sites or those comparatively dry. Its density makes it a desirable tree for wind-break purposes, and it is useful for hedges, borders, and screens at the entrance or along drives of private grounds.

White spruce makes its best growth on well-drained, moist, gravelly soil, but it is not exacting for we find it in the forest growing on rocky slopes and on the borders of lakes and streams. It occurs in pure stands, but is often mixed with red and black spruce, tamarack, birch, and poplar.

It reproduces itself well under favourable conditions. It is very tolerant of shade, and is thereby enabled to reproduce and remain alive even under comparatively dense stands. It does not thrive under such conditions, however, and, unless relieved of this oppression, in time its recuperative powers will be weakened.

Several of the larger pulp companies are planting thousands of small nursery-grown white spruce for the purpose of restocking the cut-over areas. The areas which it is practical to replant are small as compared with those cut over and destroyed by fire each year. Unless effective measures are taken to reduce the waste in logging and to check forest fires, and unless some practical means are found to combat the losses by forest insects, the exhaustion of the available spruce forests of Eastern Canada, at least, cannot be far distant.

The low branches and dense foliage of the white spruce in bad weather afford attractive shelter to the camper, and, unfortunately for the safety of our forests, under the protection of its drooping crown is the favoured site for the camp-fire. Camp-fires so placed have been responsible for much of our forest losses. The true woodsman or camper who has the welfare of the forests at heart will recognize the danger of this practice, and place his camp-fire in the open on bare rock, or, failing this, on mineral soil scraped clear of inflammable litter.

Additional copies of this document and a list of other publications issued by the Forestry Branch may be had upon application to the Director of Forestry, Ottawa.

This book is for use in
Library Building ONLY
and as a
"Reserved" Loan

SD 437 A4
3

DEPARTMENT OF THE INTERIOR, CANADA

HON. THOMAS G. MURPHY,
Minister

R. A. GIBSON,
Assistant Deputy Minister

FOREST SERVICE—E. H. FINLAYSON, Director of Forestry

DOUGLAS FIR

Tree Pamphlet No. 3
(Revised Edition)

OTTAWA
J. O. PATENAUDE
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1934

A young, open-grown Douglas fir tree. Old trees growing in the forest lose their branches on the lower parts of the trunk. On old trees the bark becomes very thick, even up to ten or twelve inches, and is a splendid protection from fire. Since 1926 the quantity of Douglas fir cut into lumber in Canada has been greater than that of any other species. It is the only Canadian timber which can be obtained in quantity in the large sizes necessary for the heaviest construction work, such as bridge building and wharf construction. It has a pleasing figure when sawn flat-grain or rotary cut, and is used extensively for doors, panelling, and almost every other detail of house construction. The wood is used also for railway ties, mine timbers, boats and scows, tanks and conduit pipes, flooring, wood pavement, piling, and telephone poles.

DOUGLAS FIR — *Pseudotsuga taxifolia*

Common names: Douglas fir, British Columbia fir, red fir, yellow fir, Douglas spruce, Oregon pine, Oregon spruce.

French names: Sapin de Douglas, Pin de Douglas, Douglas.

The Douglas fir is a western tree. In Canada it ranges from the east slope of the Rocky mountains in Alberta through to the coast in British Columbia. In the United States it grows throughout the Pacific Coast region and the Rocky mountains southward to northwestern Texas.

As will be seen by the list of names above, lumbermen have had considerable difficulty in selecting a name for this tree. In the past it has been called "spruce" and "pine" for export purposes, since to call it "fir" would class it with the true firs (the genus Abies) which are totally different in properties and in many respects inferior. Now that it has become more generally known it is usually marketed under the name "Douglas fir." This name it derived from the fact that David Douglas, a Scotch botanist, obtained the seed and planted it in England in 1827.

ANNUAL CONSUMPTION AND PRESENT STAND

Douglas fir is one of Canada's most important commercial woods. It is the principal wood used for sawn lumber, the average annual cut during the five years 1926-30 being approximately 1,419 million feet board measure, comprising one-third of the total lumber production in the Dominion.

The total stand of Douglas fir saw material is estimated at 57,390 million feet board measure, of which 35,695 million feet is accessible under existing conditions. About 70 per cent is situated on Vancouver Island and the adjacent mainland.

THE WOOD: QUALITIES AND USES

The wood of the Douglas fir is one of the hardest, heaviest, stiffest, and strongest of the native conifers. It also produces the largest structural timber growing in Canada. Great quantities are used in bridge-building, wharf construction, and heavy framework of all kinds. The wood is quite durable, and large quantities are used for railway ties and in mining operations. It also provides an excellent material for boat, scow, and other marine construction. It is used extensively in the manufacture of wooden conduit pipes, tanks, and silos.

Although the Douglas fir is more widely known as a material for heavy construction, it has properties which enable it to be used in a variety of ways. It makes a hard-wearing floor, especially when laid with the edge-grain upwards. Well-laid creosoted blocks of Douglas fir provide a long-wearing, noiseless, and dustless pavement for roadways and industrial buildings.

There is a marked contrast between the spring- and summer-wood in the annual growth-rings, and this feature gives the wood a very pleasing figure, rivalling quarter-sawn oak in beauty when sawn flat-grain or when rotary cut. It is, therefore, being used extensively for doors, panelling, base-boards, stair-work, sash, and mouldings. So wide are the uses to which the material can be put that it fills practically all the needs of a house-building wood. It is used extensively for piling and to a certain extent for telephone poles.

HABIT AND CHARACTERISTICS

The Douglas fir attains the largest size of any tree in Canada, and, with the exception of the redwood of California, is the largest tree on the continent. It grows to an immense size, sometimes exceeding 10 feet in diameter and 250 feet in height. One of the tallest Douglas firs on record had a height of 380 feet. In the Kew Gardens, near London, England, stands a single-piece flag-staff 220 feet high presented by the government of the province of British Columbia. This staff was cut from a Douglas fir tree 300 feet high. Trees 15 feet in diameter have been found, and a single tree has been cut that scaled 60,000 feet board measure.

The Douglas fir is a remarkably healthy tree, and does not suffer from insect pests and fungous diseases to the same extent as its associated species such as the Western hemlock and Western red cedar. Ages from 400 to 500 years are not uncommon.

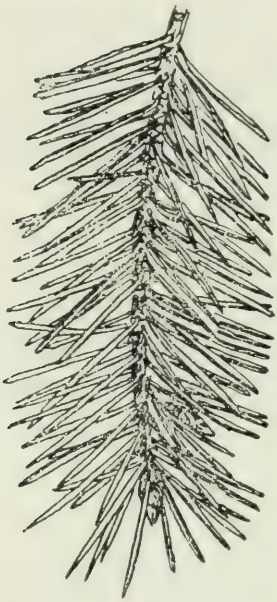
In early life the crown is sharply pyramidal in shape, with the lower branches drooping. Older trees have more or less flattened or round-topped crowns. In old age it is usually free of branches for 70 feet or more and the trunk is straight with very little taper.

The character of the bark varies with age. On young trees it is thin and smooth, and shows resin blisters similar to those on the true firs (*Abies*). Later it becomes very thick and deeply furrowed. The Douglas fir has the heaviest bark of any tree in Canada, sometimes 10 to 12 inches thick. The bark makes good fuel, burning readily but more slowly than wood.

The leaves (see Fig. 1) are flattened and pointed, dark-green above, and pale beneath. They are from one to one and one-half inches long. They are attached more or less spirally around the twig, but their narrowed base or stem permits them to arrange themselves on opposite sides of the twig in two ranks or feather-like. This arrangement, however, is not so distinctly two-ranked as in the case of the true firs.

The winter buds are sharp-pointed and free of resin. This distinguishes them from the true firs which have rather blunt or rounded buds covered with resin.

1



2

Although botanically there is only one species of Douglas fir there are some marked differences in size and general qualities of the trees growing on the mountains of inland British Columbia, as compared with those found in the moister climate of the Coast region. The Coast tree reaches a larger size and is more rapid in growth. It also develops a more open crown, with drooping branches, than does the tree of the interior. Such tests as have been made indicate that the wood of the coast type is stronger than that of the mountain type. The latter type, however, is a hardier tree, being less subject to injury by early and severe frosts when grown outside of its natural range.

REPRODUCTION AND PLANTING.

The Douglas fir is a tree of graceful proportions, attractive foliage, and good rate of growth, and might well be used to a greater extent than it is at present for ornamental planting. Where it is desired to cultivate it in Eastern Canada the hardier mountain type is recommended in preference to the coast form.

In British Columbia practically pure stands of Douglas fir are common. It is also found mixed with Western hemlock, Western cedar, Sitka spruce, and other minor species. In such mixtures there is a tendency for the Douglas fir to be replaced by the more shade-enduring species. Under favourable conditions, however, where the seed can reach mineral soil it reproduces prolifically. It thrives best on well-drained soil where the annual precipitation is between 50 and 60 inches and where the climate is moderate and not subject to extremes.

The Douglas fir has attracted considerable interest in Europe and it has for several decades been extensively used in Great Britain and on the continent for reafforestation. The coast type has been principally used, and found to make very favourable growth, especially in the British Isles, which have a climate somewhat similar to that of its native habitat. The British Forestry Commission is using this tree extensively for restocking areas cut off during the late war, and the Canadian Government has supplied them with many thousands of pounds of seed for this purpose.

ITS FUTURE PROSPECTS

The Douglas fir is Canada's most important export timber. Although the supply of the timber is situated at some distance from the world's best markets, the demand is steadily increasing as its excellent qualities become better known. An established trade has been developed with Australia, New Zealand, China, and Japan, and Canadian stands are very favourably located to supply the demand. When the present virgin stands are cut, it is doubtful whether there will ever again be harvested trees of the large dimensions being cut to-day. However, the Douglas fir reproduces readily, and there is no reason why Canada should not go on indefinitely supplying the world's markets with this wood, providing that cutting is wisely regulated so that young growth may be encouraged, and provided also—and above all—that co-operation is received from the public in protecting it against fire.

Reqn. 6434.

ASSN. SD437.A4
RIES No. 4
THE LIBRARY
University of British Columbia

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

HEMLOCK

Tree Pamphlet No. 4

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1923

A HEMLOCK TREE

To-day the hemlock ranks fourth among Canadian trees as a source of saw-timber. Years ago the only part of the tree considered to be valuable was the bark, which was, and still is, used extensively for tanning. The wood is also used for the making of wood-pulp. Even when the hemlock is growing in the forest, the branches are very persistent and the tree does not prune itself well, as the pine and the spruce do. The result is that the lumber produced from the tree is frequently knotty.

HEMLOCK — Tsuga canadensis

Common names: Hemlock, eastern hemlock, Canadian hemlock, hemlock spruce (England), white hemlock.

French names: Pruche, Pérusse (France), tsuga du Canada, sapin du Canada.

The hemlock of Eastern Canada is found from Nova Scotia westward throughout the St. Lawrence river valley and Ontario to the west end of lake Superior. In the United States it is found in Michigan, Wisconsin, Minnesota, and in the northeastern states, extending southward along the Appalachian mountains to Georgia and Alabama. This is one of three species of hemlock found in Canada. The others are the western hemlock (*Tsuga heterophylla*) and the black hemlock (*Tsuga Mertensiana*), both practically confined to British Columbia. Since the range of these does not coincide with that of the Eastern hemlock, there is little chance of confusion.

ANNUAL CONSUMPTION

For years the hemlock was despised as a lumber tree, and it is only since a scarcity of better timber began to be felt that a market has been developed for its lumber. The bark was at one time the only part of the tree considered as of commercial value. It was one of the first tanning materials used in this country, and is still used to a considerable extent for this purpose. Large numbers of the finest hemlock trees have been cut for the bark alone, and thousands of splendid logs were left to burn and rot in the forests. Fortunately this waste is not going on to-day, for now the wood is more valuable than the bark. At present hemlock occupies fourth place as a lumber producer in Canada, with an average annual cut of about 250,000,000 feet board measure. The Eastern hemlock forms approximately 85 per cent of this lumber, and the remainder is cut for the most part from the Western hemlock.

At first only the best grades of hemlock lumber found a market, but with increasing scarcity of better woods the lower grades have now come into use for box manufacture, crating, and other purposes for which a high-grade lumber is not required. The tree produces only a small percentage of first-grade material. Many of the older trees have the defect known as "shake," which is a tearing apart of the wood between annual rings due to wind. "Shaky" lumber splits readily. There is also a multitude of hard knots in the lumber, especially when sawn from the smaller trees or from top logs. This is due to the persistent branches of the hemlock.

HABIT AND CHARACTERISTICS

The mature hemlock usually reaches a height of 60 to 70 feet and a diameter of 1½ to 2 feet. Under very favourable conditions in good soil it occasionally becomes over 100 feet high and 3 to 4 feet in diameter. The trunk is very straight and undivided but very much tapered from the base upward. The branches are remarkably persistent and in mature trees commonly cover two-thirds of the trunk, forming a dense, long, conical crown. Numerous small dead sound stubs may be found almost to the ground. The branchlets are very slender and flexible.

The bark of the trunk is from 2 to 3 inches thick on old trees and, as pointed out, is an important source for tanning extract. The colour of the bark is reddish-brown, and the surface is roughened with shallow furrows and narrow scaly ridges.

Hemlock Foliage and Cone: (1) Foliage; (2) Cones.

The leaves (see Fig. 1) are flat, blunt, half an inch long, dark-green on the upper side with pale lines beneath. They are distinctly stalked, each leaf having a tiny thread-like stem by which it is attached to a small projection on the bark of the twig. This feature enables one to distinguish it readily from the firs (*Abies*), with which it might be confused. The leaves are twisted and arranged in two distinct ranks, one on each side of the twig, like those of the firs.

The cones (see Fig. 2) are very small, from one-half to three-fourths of an inch long, and of equal breadth when dry and open. They are stalked and hang downward from the twig. The seed is winged and tiny. About 400,000 cleaned seeds (free of wings) are required to weigh a pound.

THE WOOD: QUALITIES AND USES

The wood is fairly stiff, but rather harsh and splintery. It holds nails well. It is very subject to rot when placed in contact with the soil unless it has been treated with a preservative. It is not, therefore, the most desirable wood for building sills or railway ties, although large quantities are used for the latter purpose. Where hemlock is kept dry or entirely immersed in water it is very durable.

The greater part of the hemlock lumber produced is used in its rough form for joists, rafters, sheeting, boxes, crates, concrete forms, etc., purposes for which it is well adapted. The better grades are sometimes used for the interior finish and floors of inexpensive houses. It is used to a very limited extent in Canada for the manufacture of wood-pulp, but in the eastern United States, owing to the scarcity of spruce, it is of considerable importance as a pulp producer.

The wood of the Western hemlock is very much superior to that of the Eastern species. Lumbermen in their efforts to overcome the prejudice created by the name "hemlock" have made use of such names as "Grey fir" and "Alaska pine" when marketing the Western species.

REPRODUCTION AND PLANTING

The hemlock may be used to advantage in many locations for decorative planting. During youth it is a beautiful and graceful tree. Its sprays of branchlets and twigs form a delicate tracery of evergreen foliage. The annual shoots and branch-tips have not the rigidity common to most evergreens. The "leader," or tip, of the tree droops whip-like. The tree is a good shade-endurer and can be used in many positions where other trees would not do well.

The hemlock makes its best growth on fresh moist soil. It is rarely found in pure stands in Canadian forests, but is more commonly found in mixture with spruce, fir, pine, birch, and maple. It is a prolific seed-bearer but reproduces poorly. There is very little second-growth hemlock replacing the trees now being cut. This is perhaps due to the fact that cutting opens up the stands to a great extent. The shallow roots of the hemlock are extremely sensitive to the drying out of the soil.

In spite of its present importance it is doubtful whether the hemlock will continue to hold its place in the forests of the future. It is not a promising tree for forest planting. Pine and spruce are more easily grown, grow more rapidly, and yield better lumber than hemlock on the same site. When the day comes that Canada's forest areas are under more intensive management, as come it must if her people are not to lose the revenue from a large part of their lands, the hemlock will probably find a place only on the sites not suited for more desirable species.

This book is for use in
Library Building ONLY
and as a
"Reserved" Loan

SD437. A4
5

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

Western Hemlock

Tree Pamphlet No. 5

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1924

A HEMLOCK TREE

A young open-grown Western Hemlock tree. Note the whip-like, drooping tip. The wood of the Western Hemlock is much superior to that of the hemlock of the East, and lumber manufactured from it finds ready sale. It is used in construction work, interior trimming, sashes and doors, and turned stock In Canada the Western Hemlock is confined to British Columbia.

WESTERN HEMLOCK — Tsuga heterophylla

Common names: Western hemlock, hemlock, British Columbia hemlock, Alaska pine, grey fir, hemlock spruce.

French name: Tsuga de l'Ouest.

The western hemlock is found from the southern coast region of Alaska southward along the whole British Columbia coast including the Queen Charlotte and Vancouver islands. It extends into the interior along the rivers emptying into the Pacific ocean up to 5000 feet elevation where there is abundant rainfall. It is also found in the interior of British Columbia in the humid valleys of the upper Fraser and Columbia rivers. In the United States it is found southward along the coast ranges through Washington and Oregon to northern California.

ANNUAL CONSUMPTION AND PRESENT STAND

The western hemlock is one of the most important trees in British Columbia in regard to both available supply and production. In a recent survey of the forest resources of that province the quantity of standing timber of this species was estimated to be 64,000,000,000 feet board measure; of this some 52,000,000,000 feet is located in the coast region. The original virgin supply is almost intact, only a small part having been cut. The cut of western hemlock lumber has for some years averaged about 42,000,000 feet annually, forming about 15 per cent of the total hemlock lumber cut in Canada. As a pulpwood producer this tree is also important. Over 100,000 cords are cut annually for this purpose, forming approximately one-half of the total pulpwood produced in the province of British Columbia.

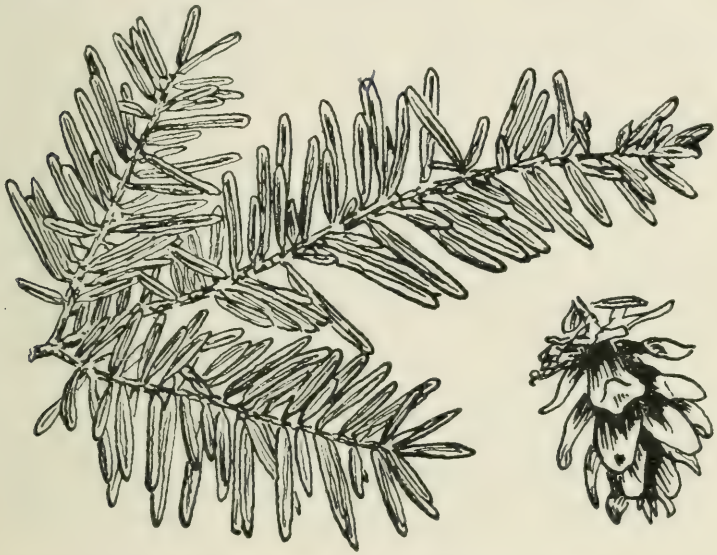
The western hemlock is one of three hemlocks indigenous to Canada. The others are the eastern hemlock (*Tsuga canadensis*) and the mountain or black hemlock (*Tsuga Mertensiana*). The natural range of the eastern hemlock and that of the western hemlock are so widely separated that there is little likelihood of these two trees being confused. The mountain hemlock, which occupies largely the same range as the western hemlock, is as a rule confined to the higher elevations.

HABIT AND CHARACTERISTICS

Western hemlock specimens have been found with a height of 250 feet and a diameter of seven feet. It rarely attains these dimensions, however, and mature trees are commonly 125 to 150 feet in height and have a diameter of 2 to 3 feet. When grown in a dense stand the tree produces a long trunk with very little taper, clear of limbs from 50 to 70 feet. The base of the trunk is often swollen or thickened.

The branches are small and pendulous and form a narrow spire-shaped crown. The tip is slender, whip-like, and drooping. This drooping tip is one of the marks by which the tree may be readily distinguished at some distance.

The bark is brownish in young trees and covered with fine scales; on older trees it is grey and deeply furrowed. It is very thin for a tree of its size. Although rich in tannin the bark is little used for the manufacture of tanning extracts, since it is claimed that because of its thinness it does not pay to collect it.



Foliage and Cone of Western Hemlock. Natural size.

The leaves (see figure) vary much in size. They are flat in cross-section, conspicuously grooved, and have blunt or rounded ends. Each leaf is attached by a short, thread-like stem. They are arranged in two more or less distinct ranks appearing to grow from opposite sides of the twig. The leaves of the black or mountain hemlock do not as a rule have this two-ranked arrangement but tend to turn towards the upper side of the twig. In cross-section, too, they are rather round or plump instead of flattened, being more like the leaves of the spruce in that respect.

The cones (see figure) are small, seldom over one inch in length. They are considerably smaller than those of the black or mountain spruce, which are from one to three inches long.

THE WOOD: QUALITIES AND USES

In the past the western hemlock did not find a ready market. This was due partly to its inferiority to its associated species, the Douglas fir, but in even greater part to the prejudice against the Eastern hemlock. The wood was condemned by the public before

it had been given a fair trial. Lumberman who knew its good qualities sold it under such names as Alaska pine, hemlock spruce, and grey fir. After a thorough trial, however, its merits became more widely known, and today it has attained a standing in the lumber market under its own name.

The wood of the western hemlock is moderately strong, of fine even grain, light in weight and colour, and odourless when dry. Under proper drying conditions it does not shrink to an abnormal extent. It is sufficiently firm and hard to take a good polish, yet it is not too hard to be easily worked. It takes, paint, stain, and glue well. Except when used in very thin pieces it has not the tendency of eastern hemlock to split. Under water or where kept continually dry it is very durable but is not as satisfactory in positions where it is exposed to dampness.

Western hemlock is manufactured into the common forms of lumber and is well suited for all but the heaviest construction work. It is suitable for scantling, joists, siding, flooring, ceiling, and laths. When sawn in a certain manner known as slash-grain it has a very handsome figure, and since it takes a high polish and is easily stained it makes handsome interior trimmings and panels. It is also suitable for sashes and doors, as well as turned stock. It is useful for the manufacture of certain kinds of furniture, such as enamelled bedroom furniture, and meets the requirements for the hidden parts of other furniture such as drawer-backs and bottoms, shelves, etc.

Considerable quantities are used in the manufacture of boxes, especially for stout packing cases, piano boxes, and other containers of heavy construction. The wood when damp resumes a somewhat sour odour, and it is therefore not the most desirable material for the containers of food which might become tainted.

OCCURRENCE, REPRODUCTION AND SUSCEPTIBILITY TO DISEASE

The western hemlock is rarely found in pure stands. It is usually found mixed with western red cedar, Douglas fir, and Sitka spruce, and appears to make its best growth in direct competition with these. It is one of the most shade-enduring species on the Pacific coast. The seedlings, although they do not make their most rapid growth under heavy shade, are able to struggle along in a suppressed but healthy condition for a long period until the natural thinning of the shading canopy lets in more light and enables them to take on a more rapid growth.

The tree is a prolific seeder and is not particular as to the soil conditions for its seed, as long as there is sufficient moisture. The seed germinates readily in damp moss and decaying vegetable matter. Young trees may be found growing on the tops of old stumps or with their roots straddling decayed logs on which they have started from seed.

The western hemlock is very much subject to insect pests and fungous disease and is perhaps the most unhealthy species on the Coast. Moreover, because of its thin bark and shallow roots it is readily injured by forest fires.

VALUE IN FOREST MANAGEMENT

Although the tree produces a useful wood and has much to recommend it to the lumberman and forester, it is doubtful if it will take a prominent place in the forests of the future after the virgin stands have been cut. It produces a less valuable material than many of its associated species, and it is therefore probable that when the forests come under intensive management the more valuable species will be encouraged at the expense of the hemlock.

No. 6
THE LIBRARY
University of British Columbia

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

RED PINE

Tree Pamphlet No. 6

F. C. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1924

A young red pine tree grown in the open. Later in life, when growing in the forest, it reaches a height of 75 to 100 feet, clear of branches for over three-quarters of its height, and with very little taper. The wood is valuable for nearly all the uses to which white pine is put, and is used to a considerable extent in construction. It grows well on very poor soil, and is likely to be largely used in forest planting.

RED PINE — Pinus resinosa

Common names: Red pine, Norway pine, yellow pine, Canadian red pine (England).

French names: Pin rouge, pin resineux, pin de Norvège.

The name "Norway pine," by which the red pine is so widely known, is an unfortunate choice for this tree, since it has no real significance. The tree is not a native of Norway nor of any country outside of the United States and Canada. Its Canadian range extends from Nova Scotia to lake Winnipeg. It is confined to the region lying south of a line running approximately from lake Winnipeg through lakes Nipigon, Abitibi, and St. John to the mouth of the St. Lawrence river. This is practically the same area as that occupied by the white pine.

PRESENT STAND AND ANNUAL CONSUMPTION

The total uncut stand of red pine of saw-timber size probably amounts to 4,000,000,000 feet board measure, the greater part of this being in the provinces of Ontario and Quebec. This tree has never been so abundant as the white pine, but it nevertheless is a tree of considerable commercial importance. The average annual cut forms about three per cent of the total saw material produced in Canada, and amounts to about 95,000,000 feet board measure.

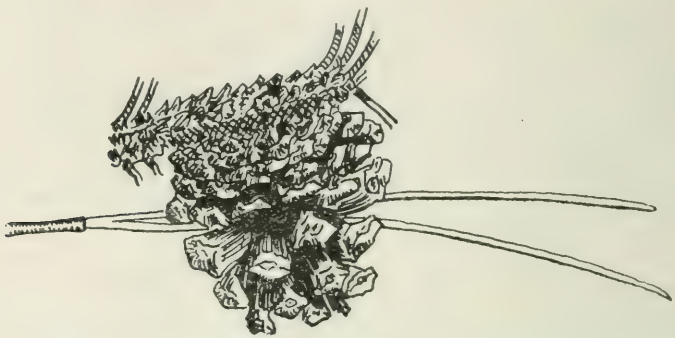
THE WOOD: QUALITIES AND USES

In colour the heartwood of the red pine is light red, the sapwood yellow or often almost white. The wood is generally darker and more resinous than that of the white pine. The softer grades, however, can scarcely be distinguished from it. Red pine is frequently mixed with white pine and the better grades of jack pine, to be sold simply as "northern pine." The better grades of red pine serve for many uses to which the white pine is put. It is soft, light, tough, moderately strong, straight-grained, and easy to work. Much red pine, however, is used for heavy construction work, and it is a very good material for masts, spars, and decks of boats. It is probably the best Eastern Canadian wood for paving blocks and the construction of water-tanks.

HABIT AND CHARACTERISTICS

The tree reaches a height of from 75 to 100 feet and upwards, with a diameter of 2 to 3 feet. The trunk is erect and has very little taper. When growing in dense stands it is clear of branches for over three-quarters of its length. On young open-grown trees the branches

are low, stout, and horizontal, and form a broad-based conical crown. The crown in older trees is more or less irregular in appearance. The twigs are stout as compared with those of other pines within its range and of a reddish colour. The foliage forms long dense dark-green tufts at the ends of the twigs, which gives the crown an open appearance as compared with that of the white pine.



FOLIAGE AND CONE OF RED PINE. NATURAL SIZE.

The needle-like leaves are from 5 to 7 inches long and occur in bundles of two. They enable one to distinguish the red pine without great difficulty, since the only other pine with two needles in a bundle occurring within its range is the jack pine. The leaves of that tree, however are very much shorter, being usually from ½ to 1½ inches long. The white pine and the pitch pine, both of which are also to be found within the range of the red pine, have, respectively, 5 and 3 needles in a bundle.

The bark of the red pine is decidedly reddish-brown in colour and is separated into broad irregular flaky scales. The contrast with the greyish and finer-scaled bark of the other pines is very striking, and it is therefore not necessary to have a long acquaintance with this tree to pick it out at a glance. The bark, which is moderately thick, resists fire fairly well and it is this feature which has probably prevented many areas from being entirely denuded of seed-trees of this valuable species.

The roots are wide-spread and deep. The tree is therefore remarkably wind-firm.

The cones are 2 to 2½ inches long and more or less spherical when dry and open. The scales are thickened at the tip and have no prickles. The white pine has a very much longer cone, while

the cones of the jack pine are usually curved at the tip and when attached to the tree usually point in the general direction of the twig. In the pitch-pine cone the tip of the scale is usually armed with a stout prickle.

PLANTING FOR USE AND ORNAMENT

The red pine is one of our most beautiful trees for ornamental planting. Given proper space to develop it is attractive at all ages. Its great masses of long, dark-green, closely bunched needles contrast strikingly with the reddish colour of the bark on its straight ragged trunk. It is a splendid tree for drives, borders, and lawns of large grounds.

The tree is not exacting as to its soil requirements and it will make satisfactory growth on soils which are too dry, sandy, or gravelly for the best development of the white pine. In this respect it occupies a position about midway between the white and jack pines. It does not appear to endure drought to the same extent as jack pine.

It is probable that the red pine will occupy a prominent place in Canadian forests when these are under intensive forest management and at a time when the people of Canada will have to depend upon trees which are satisfactory lumber producers on poor, non-agricultural soils. The tree not only makes good growth on poorer soils but it is comparatively free of insect and fungous injury, points which must be taken into consideration when planning the forests for the future.

The Ontario Government has had very satisfactory results in the use of the species for forest planting and is growing the tree in its nurseries to a considerable extent for this purpose. One of the chief hindrances to the more general planting of the tree has been the difficulty of securing an adequate supply of seed. Red pine bears cones abundantly only at infrequent intervals and as a rule the yield of seed per bushel of cones is comparatively small.

Natural stands of red pine reproduce themselves readily where the conditions are favourable. For the best reproduction the parent stand must not be sufficiently open to permit the seedlings to be dried out by hot winds and yet must not be too dense to cause the young growth to suffer from the shade. However, it is against fire that young red pine most need to be protected. If every person entering the woods does his part to lessen the fire danger the greatest step towards ensuring a constant supply of this valuable wood will have been taken.

FOR USE IN
LIBRARY
BUILDING
ONLY

SD 437 A4
7
THE LIBRARY
University of British Columbia

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

JACK PINE

Tree Pamphlet No. 7

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1925

A JACK PINE TREE

A young jack pine grown in the open. No longer looked upon as a "weed tree", the jack pine has taken a place of some importance in Canada's timber supply, notably in its uses as railway ties and as a source of wood-pulp. For reforesting poor soils the jack pine should find considerable use, as it will grow on very poor soil. The jack pine is one of the first trees to come on burned-over areas within its range.

93059

JACK PINE — Pinus Banksiana

Common Names: Jack pine, Banksian pine, princess pine, grey pine, scrub pine, Hudson Bay pine, cypress (Quebec and Maritime Provinces), juniper (Quebec).

French Names: Pin gris, pin de Banks, pin chétif, cyprès, pin des rochers.

The jack pine has a very wide range in Canada. It is found from Nova Scotia to the Rocky mountains and northward in the valley of the Mackenzie river to Great Bear lake. Its best development as a timber tree is reached in northern Manitoba, Saskatchewan, and Alberta.

ANNUAL CONSUMPTION AND PRESENT STAND

Although at one time looked upon as more or less of a "weed tree," the jack pine to-day is of considerable commercial importance. The growing scarcity of better material, together with the jack pine's wide distribution and common occurrence, has given it a place in the market. Exact figures of the lumber produced from this tree are not available, since they are not readily separated from those given for lodgepole pine, a closely related tree whose range overlaps that of the jack pine in certain parts of the West. The average annual production of jack pine ties and lumber is probably not less than 35,000,000 feet board measure, the greater part of this being utilized as railway ties. Some 30,000 cords are also cut for pulpwood and some 19,000,000 laths and 1,900,000,000 shingles are made each year.

Although accurate information is not available as to the quantity of jack pine still standing, there is estimated to be about 65,209,000,000 feet board measure of saw-material size in addition to 165,900,000 cords of pulpwood size.

THE WOOD: QUALITIES AND USES

The wood of the jack pine varies in colour from the creamy white of the sapwood to the brownish yellow of the heartwood. In texture and weight it is also variable, some grades having the weight and hardness of red pine and others being comparatively light and soft. The better grades have much the appearance and working qualities of red pine and are often sold mixed with it. The tree, however, does not produce a large percentage of clear lumber, most of it being very knotty.

Although the untreated wood decays rapidly when in contact with the earth, the greater part of the jack pine felled to-day is used as railway ties. In Eastern Canada it holds first place for this purpose, With the growing scarcity of other suitable material it is probable that it will continue to hold this place. Recently an improved method has been devised for economically treating jack pine

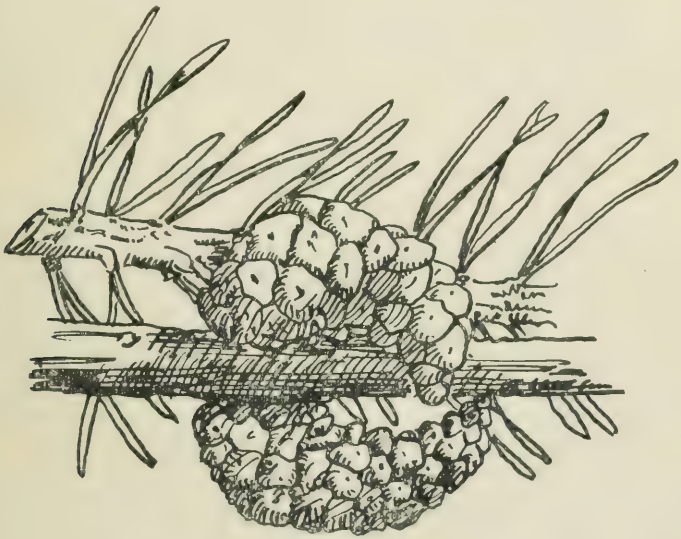
ties against decay. When this comes into general use it will result in a considerable saving of labour and material expended annually in replacing decayed ties.

Within recent years the jack pine has taken on increasing importance as a pulpwood material, since investigations have shown that with slight modifications of the processes now in use the tree can be used commercially for pulp production.

HABIT AND CHARACTERISTICS

On favourable sites and when growing in pure dense stands the jack pine develops a straight, clear trunk, and reaches a height of 60 feet and a diameter of 24 inches. When growing in the open or on unfavourable sites it is comparatively small and scrubby. Ordinarily it is about 30 to 40 feet in height with a diameter of about 12 inches. The crown, particularly on older trees, is very open, and, except where the tree is growing in dense stands, occupies about one half to two-thirds of the height of the tree.

The bark is thin and has a reddish-brown colour, with a yellowish tinge in the upper part of the tree. It is roughened by narrow rounded ridges which separate into small thick plates.



Cone and needles of Jack Pine. (Natural size)

The leaves are very short, one-half to 1½ inches long, twisted, and in bundles of two. They are distantly set along the twigs, and

therefore the tree has strikingly thin foliage as compared with the white or the red pine.

The cones are from 1 to 2 inches long and characteristically lop-sided or humped in appearance. They are usually found in pairs, one on each side of the twig, curved and pointed towards the tip of the branch on which they are attached. The cone scales are very much thickened at the tip, and except on very young cones are without prickles. It is characteristic of the cones to remain attached to the tree unopened for several years.

The jack pine in Eastern Canada can readily be separated from its associated pines by means of its leaves, which occur in bundles of two and are short and twisted. The red pine needles, which also occur in bundles of two are several times longer than those of the jack pine. The white pine has five needles to a cluster and the pitch pine three.

The native tree which the inexperienced person is most likely to confuse with the jack pine is the lodgepole pine of British Columbia and Alberta, which associates with the jack pine in nortwestern Alberta in the region about Lesser Slave lake. The bark of the lodge-pole pine is, as a rule, darker than that of the jack pine. Its foliage too, is darker, having a less distinct yellowish tinge, and the leaves which are somewhat longer, have the appearance of being bunched towards the ends of the twigs in plume-like clusters. Its cones too are not inclined to remain closed to the same extent as those of the jack pine. The scale-tips as a rule are armed with a prickle, which is absent in the mature jack pine cone.

SOIL REQUIREMENTS AND SEED PRODUCTION

The jack pine is not particular as to its soil requirements. It will grow on very poor soil and is found in pure stands on very coarse sandy lands. It is also found in scrubby open stands on bare rocky situations. It, of course, makes its best growth on well drained soils of good quality, but ordinarily it is not found on the better sites, since here it comes into competition with the more shade-enduring white pine, red pine, spruce, and balsam fir. The jack pine is decidedly intolerant of shade at every period of its development.

The tree is a good seed-producer, some seed being borne practically every year. It begins to bear seed when very young—eight to ten years old when growing in a favourable open situation. It reproduces itself well, but the reproduction is often scattered, due to the habit of the cone remaining closed. This feature, however, has its compensation, for the jack pine, thereby, is often in a position to perpetuate itself on areas which a severe fire has burned over, killing all the seed-trees—many of the partially roasted cones being then opened and freed of their imprisoned seed.

PLANTING FOR USE AND ORNAMENT

Little can be said in favour of the jack pine for ornamental planting. Its irregular open habits of growth and its thin foliage find little favour in places where more attractive species may be grown. It is, however, extremely hardy and will make satisfactory growth in every province of Canada. It has proved itself a suitable tree for planting on the prairies and is being grown in considerable quantities by the Dominion Government for distribution to settlers in the West. The Ontario and Quebec Governments have also used this tree to a considerable extent for the purpose of binding loose drifting sand.

The jack pine is a very useful tree and because of its ability to thrive on poor sites it will always hold an important position in Canadian forests provided the co-operation of all citizens is secured in seeing to it that it is not needlessly wasted by forest fires.

Additional copies of this document and a list of other publications issued by the Forestry Branch may be had upon application to the Director of Forestry, Ottawa.

FOR USE IN
LIBRARY
BUILDING

SD437 A4
No. 8
THE LIBRARY
University of British Columbia

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Acting Director of Forestry

Lodgepole Pine

Tree Pamphlet No. 8

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1925

A LODGEPOLE PINE

The lodgepole pine of the West occupies a place corresponding to that of the jack pine in the East. It gets its name from its use by the western Indians for the poles of their tepees, or lodges. It is a prolific seeder, and is one of the first species to come in on burned-over areas; hence large areas are now covered with stands of this species. It is used largely for railway ties, mine-props, and poles. It is now being used also in the making of boxes, and is useful for light construction and interior finish. It can also be used to make wood-pulp of good quality.

93060

LODGEPOLE PINE — Pinus Murrayana

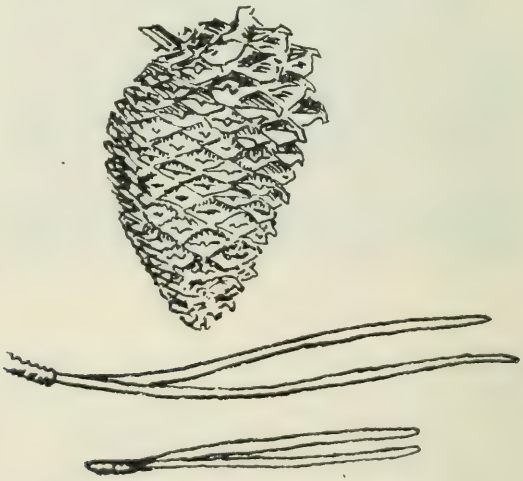
Common names: Lodgepole pine, black pine, scrub pine, shore pine, western jack pine, cypress (southern Alberta and Saskatchewan), white pine (Alberta).

French name: Pin de Murray.

The lodgepole pine has a very wide range. In Canada it extends over the whole of British Columbia and into the Yukon territory on the north and the western part of Alberta on the east. Isolated stands are also found on the Cypress hills in the southern portions of the provinces of Alberta and Saskatchewan. In the United States the tree extends southward to southern California.

HABIT AND CHARACTERISTICS

The lodgepole pine is extremely variable in its characteristics. In the western part of its range near the Pacific coast, it is ordinarily 20 to 40 feet high and 6 to 20 inches in diameter, while farther east it is 50 to 75 feet high with a diameter of 12 to 24 inches. The eastern trees usually form dense stands and develop a tall, clean, slender trunk, while those near the coast are shorter and more branchy. On account of its variable character botanists at first attempted to establish specific differences between these two types. The scrubby coast type being known as *Pinus contorta* or *Pinus contorta Murrayana*. As the tree was more thoroughly studied throughout its entire range it was found that the distinctions set up did not hold when generally applied, and it may, therefore, for practical purposes be considered a single species.



Cone and needles of Lodgepole Pine. (Natural size)

The coast form is usually known by the names "scrub pine," "shore pine," or "jack pine." The mountain, or eastern form, is usually called by its very appropriate name "lodgepole pine," since the very dense young stands of this tree provided the Indians with slim poles for their lodges or tepees.

The foliage of the lodgepole pine is a yellowish green. The leaves are borne in bundles of two and are from 1 to 3 inches long—ordinarily about 2 inches. Those of the coast type are as a rule shorter and less thick than those of the eastern type.

The cones are from three-quarters of an inch to 2 inches in length. The scales are tipped with a prickle. Cones frequently adhere to the branches for a great many years after maturing. They ripen in the late autumn and on many trees may remain closed for a number of years, although on other trees in the same locality they will open and shed their seed. Cones are frequently produced on young trees from 7 to 10 years old.

The thickness of the bark is variable. Throughout its western range it is 1 inch thick, reddish-brown, and deeply furrowed. Throughout the eastern part of its range it is thinner, greyish-brown, and comparatively smooth.

In the region about Lesser Slave lake in Alberta the lodgepole pine meets the jack pine *(Pinus Banksiana)*, which it closely resembles. The foliage, however, is darker than that of the jack pine and has the appearance of being more bunched in plume-like clusters at the end of the twigs. The cones, too, differ considerably, in that the mature jack pine lacks the prickle at tip of the scale.

OCCURRENCE AND REPRODUCTION

The lodgepole pine prefers sandy moist slopes and plateaus, but is found growing on a wide variety of soils. Although not a timberline tree it is to be found well up the mountains to an altitude of from 5,000 to 6,000 feet. It is the predominating species over large areas, since its extreme hardiness and ability to reproduce itself after fire have enabled it in many places to replace the original stands of fir, Engelmann spruce, yellow pine, and balsam fir. The fact that it produces cones at an early age and that the heat of fires frequently assists in opening the cones and thus liberating the seed give the tree a decided advantage in the struggle for existence. Although on the whole very intolerant if shaded, especially when young, this tree is able to exist in very dense stands for a considerable time. If thinning is not too long delayed it is capable of recovering and making rapid growth. It is, as a rule, rather shallow-rooted, and if a stand is too heavily thinned the remaining trees are apt to be windthrown.

THE WOOD: QUALIFIES AND USES

The wood of lodgepole pine is coarse, fairly soft, stiff, and normally straight-grained. The heartwood is yellow or yellowish brown in colour and the sapwood paler, sometimes almost white. In strength it is practically equal to western yellow pine and exceeds Englemann spruce and alpine fir. It produces stronger poles than red cedar, but not so durable in contact with the soil.

Lodgepole pine is chiefly used for railway ties, mine-props, and poles. It has not in the past been used to a great extent in the manufacture of lumber, for the reason that there has been sufficient timber of larger species available. Most of the lodgepole pine stands are still young and have not reached merchantable size. Prejudice has also had much to do with the lack of appreciation of its value. It is a useful wood for light construction and finish, especially where the surface is to be painted, and it is beginning to become important as box material, for which the fruit industry of British Columbia provides an increasing local market. Recent investigations have shown that it may become a valuable species for the manufacture of pulp. With a slight modification of the processes now in use, it can be used commercially for this purpose.

Although exact figures are not available it has been estimated that the total stand of lodgepole pine in Canada at present comprises 13,050,000 feet board measure of saw-timber size and some 50,000,000 cords of smaller material.

Additional copies of this document and a list of other publications issued by the Forestry Branch may be had upon application to the Director of Forestry, Ottawa.

LIBRARY
BUILDING

SD 437 A4
9

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, C.M.G., Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Director of Forestry

BALSAM FIR

Tree Pamphlet No. 9

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1925

YOUNG BALSAM FIR TREE

In later life, when growing in the forest, the tree assumes the characteristic forest form, with a long bole and foliage only in the upper third of its length. The balsam fir in its earlier years will stand considerable shade, but in later life its need for light increases. The tree is easily distinguished by its erect cones and the blisters on its bark, which are filled with a resin that furnishes the "Canada balsam" of commerce. The leaves and twigs appear opposite or nearly so. The wood finds a special use in the manufacture of wood-pulp, and is also used to a considerable extent in the manufacture of boxes, crates, etc. The tree reproduces readily, and is apparently displacing the more valuable spruce in many cut-over stands. Many thousands of cords of the wood have been destroyed by the "spruce budworm," and the annual loss from fire is also very large.

BALSAM FIR — Abies balsamea

Common names: Balsam fir, fir, balsam, white fir, var (Maritime Provinces), silver spruce, white spruce (Cape Breton), Canadian fir (England).

French names: Sapin baumier, sapin blanc, sapin rouge.

The balsam fir is one of Canada's most widely distributed trees. It ranges along the Atlantic coast from Nova Scotia to Labrador, westward and northward through New Brunswick, Quebec, and Ontario to Hudson bay, the Prairie Provinces to Great Slave lake, and westward into northern British Columbia and Yukon territory. It is one of three species of this genus (*Abies*) native to Canada. The others are the Lowland fir (*Abies grandis*) and the Alpine fir (*Abies lasiocarpa*), both confined to British Columbia.

HABIT, FORM, AND CHARACTERISTICS

The balsam fir is an evergreen tree 50 to 60 feet in height and 1 to 2 feet in diameter. It has a broad, symmetrical, pyramidal crown of considerable depth in proportion to the length of clear trunk. The branches grow out in more or less regular whorls. Where the trees are crowded, the crown is short, narrow, and sharp. The root-system is shallow, and the tree is therefore subject to being wind-thrown where stands are opened after cutting.

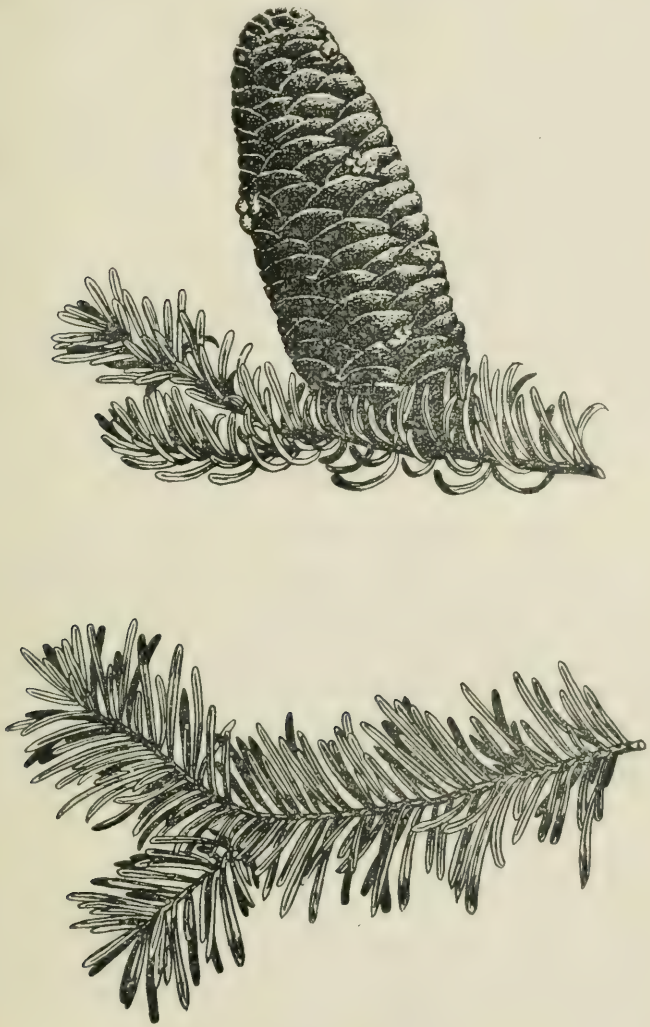
The bark is greyish-brown in colour, thin, smooth in young and middle-aged trees, and conspicuously marked with raised blisters or pockets. These blisters when broken exude a transparent, fragrant oily resin or liquid gum; this gum is the "Canada balsam" of commerce, used as a medium for mounting microscopic objects.

The leaves are as a rule about $\frac{1}{2}$ inch long, dark green and shiny, pale below, flat, grooved, and blunt or sometimes slightly notched at the tip. Those on the more vigorous terminal shoots are usually more sharply pointed. The leaves are without stalks, and, while actually spirally arranged they are usually twisted so as to form two ranks along the twig as in the hemlock. On leading shoots and fruit-bearing twigs they have a more upright or bristling arrangement.

The twigs frequently occur in pairs almost opposite to each other on the branch. They are smooth, and, after the leaves have dropped off, are marked by small circular scars left at the base of the leaf. The winter buds are small, blunt-pointed, and covered with resin.

The cones are cylindrical-shaped, 2 to 4 inches long, and 1 inch or more in diameter when mature. They have a violet or purplish colour when ripe, and occupy the extreme top of the tree near to the ends of the upper branches. They stand erect and do not hang down from the branch as in the case of most cone-bearing trees. In

the autumn, when ripe, the cone-scales fall apart, scattering the seed, and leave the central core or axis of the cone standing. The seeds are winged and borne two behind each cone-scale.



Foliage and cone of balsam fir.

PLANTING REQUIREMENTS

The symmetrical growth, deep-green foliage, and shade-enduring qualities of the balsam fir make it a valuable tree for ornamental planting on many sites. It does best in cool, moist locations, but will

not thrive on hot dry sites. It makes a more satisfactory Christmas tree than the spruces, since it retains its foliage for a considerable time after cutting.

Throughout its range the balsam fir is associated with the spruce, occurring for the most part in mixed stands, but occasionally, particularly at the eastern end of its range, it occurs in pure stands of considerable extent. It reaches its best development in Quebec and Ontario, in soils somewhat moister than those preferred by the spruce.

Compared with spruce the fir is short-lived. Trees of the larger sizes are very much subject to heart-rot. It is tolerant of considerable shade, especially when young, but requires for its best development more and more light as it matures.

Seed-production begins when the tree is between 20 and 30 years of age. The proportion of the seed which is capable of germinating is small as compared with that of the spruce.

Some seed, however, is produced every year; and it is probably due to this fact, combined with the rapid growth of the tree when young, that the balsam fir is apparently replacing spruce in many cut-over areas.

THE WOOD: ITS QUALITIES AND USES

The balsam fir, though in general inferior to the spruce, with which it associates in our forests, is a tree of great economic importance. A few years ago it was considered to have comparatively little value, but with the increasing shortage of spruce and the tremendous expansion of the pulp and paper industry the cut of this wood has increased remarkably. To-day it forms approximately one-quarter of the wood used in the pulp-making industries of this country.

The balsam fir is not so highly valued as the spruce in the pulp industry, largely due to the fact that it yields less pulp per cord, but also because of somewhat more trouble being given by resin in the freshly cut wood. Furthermore, where the wood has to be floated by water for long distances there is often greater loss due to sinking.

Although the chief commercial value of balsam fir lies in the direction of the pulp industries, it is also an important lumber, lath, and shingle producer. As a lumber producer it occupies 6th or 7th place among the native woods. The average annual cut during the past five years has been approximately 107,000,000 feet board measure of lumber. In addition, some 16,000,000 laths and 7,700,000 shingles are made of this wood each year.

The wood of balsam fir is softer, more brittle, and less strong than that of spruce and therefore is used largely where strength is not of paramount importance. It is extensively used in the manufacture of cases, crates, and cheese boxes, and to a certain extent for sash, doors, and siding. It is also used to a small extent in cooperage.

Being light and tasteless, it makes a satisfactory container for foodstuffs. It saws easily, dries quickly, and is not subject to serious warping or twisting. It takes paint readily, but where not so protected decays readily in moist situations.

PRESENT STAND

Although accurate information is not available as to the quantity of merchantable balsam fir still standing in Canada, it has been estimated to be about 48,000,000·000 feet board measure of sawmaterial size, in addition to some 163,000,000 cords of pulpwood size.

LOSS FROM SPRUCE BUDWORM

One of the serious enemies of the balsam fir in the forests of eastern Canada in recent years has been the so-called spruce budworm (*Cacœcia fumiferana*). The larvæ of this insect have been responsible for the defoliation and subsequent death of immense areas of balsam fir and spruce, the greater damage apparently being done to the fir. It has been estimated that during the past ten or fifteen years some 85,000,000 cords of balsam fir material have been killed by this insect in the provinces of New Brunswick and Quebec.

ANNUAL LOSS FROM FIRES

Forest fires, too, have taken their immense annual toll from the balsam fir stands. It has been estimated that 115,000,000 cubic feet of this wood are utilized annually, and 81,000,000 cubic feet are permitted to be needlessly burned, that is, each year approximately three-quarters as much balsam fir is destroyed as is used. By far the greater number of forest fires are due to carelessness or thoughtlessness and if the immense drain on this valuable resource is to be stopped, there must be a vastly increased public vigilance in preventing such fires.

Additional copies of this document and a list of other publications issued by the Forestry Branch may be had upon application to the Director of Forestry, Ottawa.

SD437. A44
10

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, C.M.G., Deputy Minister

FORESTRY BRANCH
E. H. FINLAYSON, Director of Forestry

CEDAR

Tree Pamphlet No. 10

F. A. ACLAND
Printer to the King's Most Excellent Majesty
OTTAWA
1926

EASTERN CEDAR

CEDAR GROWN IN THE OPEN

CEDAR IN THE FOREST

Grown in the open, the cedar assumes the form shown in the figure on the left. In thick stands the trees become like those in the figure on the right. The stringy bark which so strikingly characterizes the tree is shown in the latter picture. The wood is remarkably resistant to decay, and was for a long time the wood most used by the railways for ties. For the same reason it has been a favorite wood for poles, fence-posts, fence-rails, and shingles. The supply is now greatly depleted. The cedar is also a favorite ornamental tree.

CEDAR — Thuja occidentalis

Common names: cedar, white cedar, eastern cedar, northern cedar, arbor-vitae.

French names: Cedre, cedre blanc, thuja.

The name "Cedar" is said to be derived from the Arabic "Kedr," meaning value or worth. It has been applied to a remarkably large number of different tree species. Some sixty genera occurring throughout the temperate and tropical regions of the world are known by this name. Properly, it should be applied only to the genus *Cedrus*, of which the cedar of Lebanon (*Cedrus libani*) is a species. The so-called cedars of Canada are, therefore, not true cedars but belong to an entirely different genus.

The cedar (*Thuja occidentalis*) is found from eastern Nova Scotia and Prince Edward Island, westward throughout New Brunswick, southern Quebec, and southern Ontario, to the south end of James bay on the north, and in Manitoba to the southern end of lake Winnipeg. It also occurs in an isolated patch near the north end of lakes Winnipeg and Winnipegosis.

This tree is one of two species of the genus *Thuja* that are native to Canada, the other being the western cedar or British Columbia red cedar, which, as the name would indicate, is to be found in British Columbia. Since the ranges of the two species do not coincide at any point, there is little chance of their being confused.

HABIT AND CHARACTERISTICS

The cedar is a small evergreen tree, averaging about 45 feet in height and 1 foot in diameter, but sometimes reaching a height of 80 feet and a diameter of 3 feet.

The trunk is short, much tapered, and frequently buttressed and fluted at the base.

The crown is conical, dense, long, and narrow. Young, open-grown trees have a very trim, neat, artificial appearance.

The bark is greyish- to reddish-brown in colour, thin, and separated into long, shreddy strips, which often have a spiral twist.

The tiny, scale-like, evergreen leaves occur in pairs on opposite sides of the twig, arranged four in a row. They overlap like the shingles on a roof, and completely cover the fan-like spreading branchlets. When crushed, they have a pleasant, characteristic, aromatic odour.

The cones are small, $\frac{1}{3}$ to $\frac{3}{4}$ inch long, and comprised of eight to twelve cinnamon-brown scales, which are arranged opposite in pairs. The cones are among the smallest produced by any species of cone-bearing tree indigenous to Canada. The tiny seeds are winged and are two in number under each scale.

Foliage and Cone of Cedar

THE WOOD: QUALITIES AND USES

The wood of the cedar is very light, soft, comparatively weak, brittle, fine, even- and straight-grained. It is pleasantly aromatic, resistant to moisture and changes in temperature, and easy to work. The colour is a light brown, which darkens with exposure.

It is remarkably durable, probably the most decay-resisting native wood. For this reason it is extensively used for poles, ties, fence-posts, rails, and shingles. Many of the cedar fence-rails split by the early settlers are still in use today.

Some 663,000,000 shingles and 17,000,000 laths are made of this material annually. In addition some 24,000,000 feet board measure are sawn into lumber.

In the form of sawn lumber the sash and door industry employs the greatest quantity, but the uses to which the wood is put cover

all purposes where resistance to weather conditions and moisture is important. It is a valuable wood for boats, canoes, greenhouses, pumps, tanks, cisterns, tubs, buoys, and floats. It is also used for certain kinds of cooperage and boxes where lightness is desirable and great strength not essential. Considerable quantities are also employed in the manufacture of small woodenware.

From thirty to thirty-five years ago, the wood was extensively used to pave the streets in eastern Canadian and United States cities and towns. It was laid in the form of round blocks, 6 inches high, cut from logs 5 to 10 inches in diameter. This pavement, however, did not wear well—mainly on account of the faulty method of laying —and has since been replaced with other material.

PLANTING FOR USE AND ORNAMENT

The trim, symmetrical shape of the cedar, combined with its fine colour and dense foliage, has for generations made this tree one of the most popular evergreens for decorative planting throughout eastern Canada. Its shade-enduring qualities make it one of the most useful trees for planting about the home and outbuildings in locations where few other trees would do well. It stands clipping well and is one of the most satisfactory trees for those who desire to maintain a compact evergreen wall or formal hedge. Several ornamental varieties of the cedar have been developed by the commercial nurserymen.

Little is known as to how the cedar will respond to silvicultural treatment and up to the present little use has been made of it for forest planting. Although for some time resort will be made for the supply to the natural reproduction in swamps and rugged places, the time will doubtless arrive when it will be necessary to put the remaining stand under proper scientific management if a steady supply of this very useful wood is to be maintained.

The cedar is adapted to a wide range of soils. It may be found growing in exceedingly wet sites, and on the shallow dry soils at the tops of rocky ridges. The best development, however, is reached on moist sites. Most of the commercial stands are found bordering on swamps and in low situations where many other trees have difficulty in maintaining themselves.

PRESENT STAND AND LOSS BY FIRE

The moisture-enduring characteristic of this tree probably accounts for the fact that the cedar has not suffered to the same extent by forest fires as have many other species. It has been estimated that the average annual loss of jack pine by fires has been 80,000,000 cubic feet for every 106,000,000 cubic feet used, while only 12,000,000 cubic feet of cedar is so destroyed for every 100,000,000 cubic feet used.

The supply of eastern cedar is being depleted, and the cut reported shows a general tendency towards reduction. An accurate figure as to the total remaining stands is not available, but the most reliable estimate indicates that there is still standing some 5,050,000,000 cubic feet, composed of approximately 6,097,000,000 feet, board measure, of saw-timber size, and 31,750,000 cords of smaller dimensions. The greater quantity of the remaining material is to be found in the provinces of Quebec and New Brunswick.

Additional copies of this document and a list of other publications issued by the Forest Service may be had upon application to the Director of Forestry, Ottawa.

SD437. A4
No. 11

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, MINISTER: W. W. CORY, C.M.G., Deputy Minister

FOREST SERVICE
E. H. FINLAYSON, Director of Forestry

WESTERN CEDAR

Tree Pamphlet No. 11

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1926

WESTERN CEDAR

Western Cedar in the coastal region of British Columbia. This illustration shows the large size attained by the tree and gives a good representation of the stringy bark, which is a striking characteristic. The Western cedar is known all over Canada and the United States as the wood from which shingles and telegraph and telephone poles are made. It was much used by the Indians of the Pacific coast for totem-poles and canoes.

WESTERN CEDAR — Thuja plicata

Common names: Western cedar, red cedar, western red cedar, British Columbia cedar, British Columbia red cedar, giant cedar, giant arbor-vitae.

French name: Thuja géant.

In Canada the genus *Thuja* is represented by two native species. One of these is the cedar or arbor-vitae *(Thuja occidentalis)* of eastern Canada and the other is the Western or red cedar *(Thuja plicata)* of British Columbia. Since the natural range of these two species is so widely separated there is little likelihood of these trees being confused in the woods. The so-called yellow cedar or yellow cypress *(Chamaecyparis nootkatensis)* which resembles the genus *Thuja* does lie within the range of the Western cedar and may readily be mistaken for it at first glance. A closer examination of the foliage, however, will show that the yellow cypress leaves have distinctive, sharp, spreading points which make the spray harsh to the touch. There is also considerable difference between the cones of these two trees.

RANGE, HABIT AND CHARACTERISTICS

The Western cedar in Canada is confined to the province of British Columbia where it is found on the Pacific coast northward as far as Alaska and, in the southern part of the province, within the coast region and the Interior Wet Belt, which lies to the west of the Rocky mountains.

It is a very large tree, commonly having a height of 150 to 175 feet or even more and a trunk diameter of 4 to 8 feet or more. The trunk is very much tapered and the base, particularly in the larger trees, is swollen or flared out. When the tree is growing in the open, the branches tend to remain on the lower portion of the trunk, forming a narrow conical crown.

The bark of the Western cedar is cinnamon-red in colour with the outer surface greyish-brown where it has been exposed to the weather. It is seldom over an inch thick, even on old trees. The

Foliage and cones of Western cedar.

surface is broken by shallow grooves into ridges or strips which extend irregularly, but continuously, the length of the trunk. The inner bark is tough and fibrous and may readily be separated into long shreds. This material is used by the Indians for making baskets and matting.

The foliage is yellowish-green in colour which contrasts with the foliage of the other species with which this cedar associates and makes the tree conspicuous. Like those of the eastern cedar the leaves are minute and scale-like in pairs on opposite sides of the twig and arranged in four rows. They are evergreen and completely cover the flat, spreading, fan-like branchlets like the overlapping shingles on a roof.

The fruit is a small cone about $\frac{1}{2}$ inch long with six fruiting scales. The tiny seeds are borne, two in number, under each scale and each is surrounded by two narrow membranous wings.

The root-system, although shallow, rarely growing below four feet, is wide-spread and except on very wet sites the tree is fairly wind-firm.

THE WOOD: QUALITIES AND USES

The wood of the Western cedar is light, soft, and not strong. It varies from dark reddish-brown to a light straw colour. The sapwood, usually not more than 2 inches wide, is very light in colour, sometimes almost white.

The grain is usually straight and even. The proportion of summer-wood is small. The wood has an aromatic odour and is free from pitch. It is, however, the durability and lightness of the wood, combined with the large proportions of clear material that it yields, that have made this cedar one of the most important timber trees in British Columbia. Perhaps the most important characteristic of the wood is its resistance to decay, which makes it particularly valuable for use in situations where it is exposed to the weather or is in contact with the soil. Fallen logs in the woods will remain sound for centuries.

More shingles are made from the Western cedar than from any other species. Over 2,500,000,000 shingles were cut in Canada from this tree in 1924. In addition, over 100,000,000 board feet of lumber, 7,000,000 laths, and an immense number of poles and posts were produced from it in the same year. This cedar forms about 87 per cent of the total cedar cut in Canada each year.

Although the Western cedar is used chiefly in the form of shingles and poles, it is also extensively used in the manufacture of a wide range of products. Considerable quantities are used in house construction as bevel siding, interior finish, ceilings, mouldings, sash and doors, store fixtures, etc. It is also used for tubs and tanks, boats, chests, garden furniture, and hot-house construction.

The remaining stand of Western cedar in British Columbia is estimated to amount to approximately 17,000,000,000 cubic feet; of this 75,000,000,000 feet board measure (approximately 16,000,000,000 cubic feet), is suitable for sawing into lumber and shingles, and 3,000,000 cords of smaller material can be used for posts and small poles.

The Western cedar is found chiefly in wet or constantly moist situations where precipitation is abundant such as are found along the coast and in the interior wet belt of British Columbia.

It sometimes forms pure stands, but is usually associated with a number of other species, such as the Sitka spruce and yellow cypress in the north and the Douglas fir and the western hemlock in the south.

The western cedar is very tolerant of shade. It will survive fairly heavy shading for many years and respond quickly by increased rate of growth when more light is received.

Compared with Douglas fir the western cedar is slower in both height and diameter growth. Under favourable conditions it will add annually about 1½ feet to its height and ¼ inch to its diameter for the first 50 years.

LENGTH OF LIFE AND REPRODUCTION

This cedar is a very long-lived tree, one specimen having been reported over 1,000 years old. It is not much subject to disease until it reaches a large size. Butt-rot then begins to develop and as a result many of the larger trees have hollow bases. The tree has few serious insect enemies with the possible exception of certain boring beetles which do more or less injury by tunnelling the wood.

The tree is an abundant seeder and some seeds are borne each year, although heavy seed-years occur at longer intervals. This fresh seed germinates readily and a new growth quickly takes the place of an opening in a stand, provided there is sufficient moisture in the soil. Given protection against fire, the Western cedar will always hold an important position in the forests of British Columbia.

Additional copies of this document and a list of other publications issued by the Forest Service may be obtained upon application to the Director of Forestry, Ottawa.

SD437 .A4
12

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, MINISTER: W. W. CORY, C.M.G., Deputy Minister

FOREST SERVICE
E. H. FINLAYSON, Director of Forestry

SITKA SPRUCE

Tree Pamphlet No. 12

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1926

SITKA SPRUCE

The tree with the figures at the base is a splendid specimen of Sitka spruce. It grew in the Fraser valley, British Columbia, and was selected during the war by the Imperial Ministry of Munitions for the manufacture of aeroplanes, on account of its straightness and freedom from knots and other defects.

28254

SITKA SPRUCE — *Picea sitchensis*

Common names: Sitka spruce, tideland spruce, coast spruce, aeroplane spruce, western spruce, silver spruce, Menzies spruce.

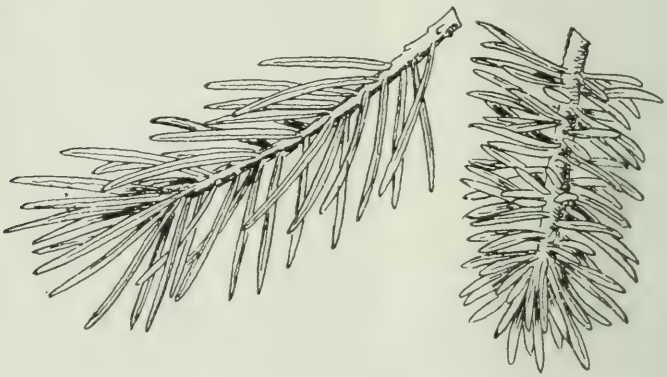
French name: Epinette de Sitka.

The Sitka spruce occurs in the forests of the Pacific coast mainland and adjacent islands and has a range extending from Alaska to northern California. It extends nowhere far inland from the coast, rarely being found more than 50 miles from tide-water. It is usually confined to the valley bottoms, rarely occurring in commercial sizes above 1,000 feet elevation. Most of it is found below the elevation of 400 feet. It is the only spruce found in the region in which it grows.

HABIT AND CHARACTERISTICS

The Sitka spruce is the largest and most imposing of all spruces, attaining a height of 160 to 180 feet and a diameter of 8 to 12 feet. Single trees contain from 8,000 to 10,000 feet board measure and occasionally up to 15,000 board feet.

When grown in a dense stand it produces a long trunk clear of branches for from 40 to 80 feet and with very little taper above its somewhat swollen base. Growing in the open, it retains its branches well to the ground, forming a pyramidal crown.



Foliage of Sitka spruce, natural size.

The branches are horizontal, frequently with many slender hanging side-branches. The larger branches become pendent with age. Young twigs are smooth and yellowish-brown.

The root-system is spreading and shallow. As a rule it runs close to the surface under the moss, duff, and other debris.

The bark is reddish-brown and very thin. Its surface peels off in large flat, thin scales.

The leaves of the Sitka spruce are dark bluish-green in colour, more or less four-sided in cross-section, stiff, thick, and sharp-pointed.

The cones, which usually hang from the tips of the branchlets, are borne at the top of the tree. They vary from $2\frac{1}{2}$ to 4 inches in length and are borne on short stalks. The scales are thin and papery and have irregular edges. The colour varies from green to dark brownish-red when mature.

THE WOOD: QUALITIES AND USES

The wood of the Sitka spruce is light in colour; the heartwood, however, is slightly darker than those of other spruces, being a brownish-cream in colour. In its natural state, the planed surface presents a beautiful soft, satin-like lustre. It is straight-grained, light in weight, easily worked, and strong in relation to its weight.

This wood is the foremost wood in the world for use in the construction of aircraft, and during the late war immense quantities were cut for this purpose. There is no wood that is obtainable in like sizes and quantities which is lighter in weight and yet has its strength, softness, and resilience. It can withstand impact or suddenly applied loads. It is tough and does not splinter easily. Furthermore, it can be readily air-dried or kiln-dried.

Before the war, the Sitka spruce was not widely known outside of the Pacific Coast region. Here, however, it had been used for some time for cooperage, boxes, and interior trim for dwellings and office buildings. More recently, eastern manufacturers have begun to use it for the manufacture of sash and doors, kitchen furniture, sounding boards for pianos, horns for phonographs, boats, oars, paddles, spars, wagon sides, car stock, and ladders. It is also a valuable source of paper pulp.

Sitka spruce is shipped in all sizes up to 30 inches wide and 40 feet long. The export sizes are commonly 2, 3, and 4 inches thick, 8 to 12 inches wide and 10 to 40 feet long.

GROWTH, REPRODUCTION, TOLERANCE

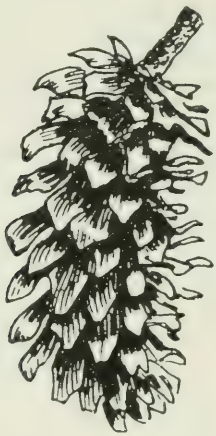
The Sitka spruce is seldom found in pure stands, but is usually associated with western cedar, western hemlock, lowland fir, and yellow cypress. It reaches its best development in the valley bottoms and along the shores of the protected waterways. It is a prolific seeder and the seed usually has a high rate of germination. When young it will stand very dense shade, but later is not so shade-enduring as the western hemlock or western cedar. Its more rapid growth, however, enables it to compete with these species on favourable sites.

This tree is highly prized in the United Kingdom, where it makes very satisfactory growth. The Dominion Forest Service each year furnishes the British Forestry Commission with several tons of seed for the purpose of reforesting the British Isles.

Little is known as to how this tree will respond to silvicultural treatment in Canada, since up to the present very little of it has been used for forest planting. When the time arrives, however, to practise intensive forestry in the Pacific Coast region the Sitka spruce will doubtless hold a prominent place in the future forest.

PRESENT STAND AND ANNUAL CONSUMPTION

Although one of the most valuable trees in British Columbia, the Sitka spruce is not abundant. It forms less than 7 per cent of the merchantable stand on the coast. Most of it is found in the northern region from about the head of Vancouver island to Portland Canal, including the Queen Charlotte islands, where it reaches its maximum development. The present stand of this material is estimated to contain some 12,000,000,000 board feet of saw size and approximately 1,000,000,000 board feet of smaller material suitable for use for pulp. The average annual cut is approximately 133,000,000 board feet, of which about 40,000,000 board feet is used in the manufacture of pulp and paper.



Cone of Sitka spruce, natural size.

Additional copies of this document and a list of other publications issued by the Forest Service may be obtained upon application to the Director of Forestry, Ottawa.

13

DEPARTMENT OF THE INTERIOR, CANADA
HON. CHARLES STEWART, Minister; W. W. CORY, C.M.G., Deputy Minister

FOREST SERVICE
E. H. FINLAYSON, Director of Forestry

WESTERN YELLOW PINE

Tree Pamphlet No. 13

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1928

50040

Thrifty stand of Western Yellow Pine

Single Western Yellow Pine tree, growing in an open stand.

WESTERN YELLOW PINE — *Pinus ponderosa*

Common trade names: Western yellow pine, western soft pine, Pondosa pine, mountain pine, mountain western pine, bull pine, yellow pine, British Columbia soft pine, California white pine (Cal.), Arizona white pine (Ariz.).

French name: Pin à bois lourd.

The western yellow or soft pine in Canada is irregularly distributed over the southern drier interior portions of British Columbia between the eastern slopes of the Cascade range and the western slopes of the Rocky mountains. It is found in the valleys of the Similkameen and Nicola rivers, down the Fraser to Nahatlatch river and up to Canoe creek, Bonaparte river, up the North Thompson to Vavenby, South Thompson river, Okanagan lake, Lower Arrow lake, Kootenay lake, and up the Kootenay valley to Windermere lake and Cross river. Most of its range lies south of the Canadian Pacific Railway main line.

It is found on well-drained plateaux or slopes, usually between 1,500 and 2,500 feet elevation, but extending on southerly slopes up to 3,500 feet. It occurs in park-like open stands, sometimes alone but usually mixed with Douglas fir, when it ordinarily comprises about fifty per cent or more of the stand.

It is estimated that there are approximately 3,500,000,000 feet of western yellow pine in British Columbia. The annual cut is approximately 40,000,000 feet. It forms a large portion of the timber cut along the Kootenay and Kettle rivers and in the Okanagan and Nicola valleys.

HABIT AND CHARACTERISTICS

Under particularly favourable conditions, the western yellow pine reaches the height of 160 to 170 feet and a diameter of 5 to 6 feet. Ordinarily, it attains a height of 75 to 80 feet and a diameter of 2 to 4 feet. Grown in a close stand, it develops a smooth straight trunk with very little taper until the lower branches of the crown are reached. It has a slow, even growth and is long-lived. Specimens over 600 years old have been found.

The bark of the mature tree is from 2 to 4 inches thick and divided by deep dark-grey fissures into broad, shield-like, reddish to yellowish plates. The surface of the plates is flat and made up of small scales. This thick bark affords protection against ground fires.

The branches are short, stiff, much branched, and turn up towards the end, giving the tree a very characteristic appearance. There is a suggestion of orange peel in the smell of a freshly broken young twig.

The leaves are very stout and stiff, and from 5 to 11 inches in length. They are dark-green in colour and borne in heavy, brush-like clusters at the ends of the bare branches. This pine is peculiar in having leaves in bundles of both three and two leaves, although

Foliage and Cone of Western Yellow Pine

three is the common number. It is the only pine native to western Canada with three leaves in a bundle.

The cones vary from $2\frac{1}{2}$ to $5\frac{1}{2}$ inches in length and $1\frac{1}{2}$ to 3 inches in diameter. When mature they vary in colour from purplish green to brown. The cone scales are tipped with a prickle. When the cone drops, a few of the scales are frequently left attached to the branch.

THE WOOD: QUALITIES AND USES

The wood of the western yellow pine is light, soft, strong in proportion to its weight, and works very easily and smoothly, without splintering or splitting. It offers a fine smooth surface and a very attractive grain. It takes and retains paints, stains, and varnishes well. It seasons well, being free from warping and checking. Once seasoned, it holds its shape without shrinking or swelling.

The wood varies in colour and texture according to the part of the log from which it is cut. The outer wood is yellowish-white, with a fine grain and satiny texture. The inner wood is somewhat more reddish in colour and somewhat harder and coarser in grain.

Since the wood takes paint well, it makes a suitable lumber for outside use, especially for siding and sash and doors. It is, however, not durable in contact with the ground unless treated with preservatives. Considerable quantities are cut into the ordinary dimension material used in building construction, such as rafters, joists, studding, etc. It has very much the same texture and other qualities as white pine and is used for the same purposes. Because of its softness, even texture, ease of working, and pleasing appearance, and owing, also, to the fact that any form of enamel, paint, varnish or stain may be used on it, the wood is extensively used for interior trim. It is also used to some extent for foundry patterns, turnery, kitchen furniture, agricultural implements, cooperage, and boxes.

SEED PRODUCTION AND USE IN REFORESTATION

The western yellow pine is a prolific seeder and will reproduce well when protection is given to the seedlings against destruction by fire. As to how this tree will respond to silvicultural treatment in Canada, little is known, but it will doubtless retain a prominent place in the forests of the region in which it is native.

Such efforts as have been made by the Dominion Forest Service to utilize this species for planting under conditions peculiar to the open western prairies have not so far proved successful, although it is possible a strain suitable for prairie planting may be found.

In Europe and in New Zealand the tree is being used to a considerable extent for reforesting. The Dominion Forest Service in one year alone has supplied the New Zealand Forest Service with over one and one-half tons of this seed for the purpose of reforestation. Lesser quantities are supplied each year to other parts of the British Empire.

UNIVERSITY OF BRITISH COLUMBIA
The
NOV 1 - 1944
Library

University of British Columbia Library

DUE DATE

MAY 2 2 198[illegible]	
MAY 2 2 RECD	
OCT 2 1 1970	
OCT 2 1 RECD	
OCT 1 7 1975	
OCT 2 2 RECD	
JAN 2 5 1977	
JAN 2 7 RECD	
MAY 3 0 1978	
MAY 3 1 RECD	
MAR 19 1979	
REC'D MAR 1 3 '79	
APR 2 5 1979	
REC'D APR 1 7 '79	

FORM 310

AGRICULTURE
FORESTRY
LIBRARY

Cum est

PLEASE RETURN TO INTERIOR & WESTERN FORESTRY BRANCH

FORESTRY
AGRICULTURE
LIBRARY